

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE



In Re Application of:

Date:

Kyusik SIN et al.

Conf. No.: 5517

Serial No: 09/828,635

Group Art Unit: 1773

Filed: April 5, 2001

Examiner: Bernatz, Kevin M.

For: SPIN VALVE SENSORS HAVING SYNTHETIC ANTIFERROMAGNET  
FOR LONGITUDINAL BIAS

**DECLARATION UNDER 37C.F.R. 1.131**

I, Kyuski Sin, hereby declare that:

1. I am an inventor of the subject matter recited in the claims of the above-identified application.
  
2. Prior to March, 2001, I and my co-inventors conceived of the idea of a sensor including first, second and third ferromagnetic layers that are interleaved with first and second nonferromagnetic layers, as well as first and second antiferromagnetic layers. The first nonferromagnetic layer adjoins the first and second ferromagnetic layers. The second nonferromagnetic layer adjoins the second and third ferromagnetic layers. The first and third ferromagnetic layers have magnetic moments with directions that are fixed in response to an applied magnetic field. The second ferromagnetic layer has a free portion and a fixed portion. The free portion has a magnetic moment with a direction that rotates in response to

the applied magnetic field. The fixed portion has a magnetic moment with a direction that does not rotate in response to the applied magnetic field. The first antiferromagnetic layer adjoins the first ferromagnetic layer. The second antiferromagnetic layer adjoins the third ferromagnetic layer. In the sensor, one of the first and second antiferromagnetic layers has a low blocking temperature, while the other of the first and second antiferromagnetic layers has a high blocking temperature.

3. My co-inventors and I conceived of this invention while working for Read-Rite, Corp. (now Western Digital Corp.), in Fremont, CA.
4. Attached Exhibit A is an Invention Disclosure dated April 19, 2000 that I prepared summarizing the present invention, including the use of antiferromagnetic materials with a lower blocking temperature and a higher blocking temperature.
5. Between preparation of the Invention Disclosure and filing of the application, the disclosure was rated, sent to outside counsel for preparation of a patent application, and approved for filing.
6. On April 5, 2001, the present patent application describing and claiming my invention was filed.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Kyusik Sin

12/20/2005

Date

**READ RITE CORPORATION**

INVENTION DISCLOSURE

LOG NO. 1681

PLEASE SEE REVERSE SIDE FOR PROCEDURE

**TITLE: Spin Valve Sensors with Longitudinal Bias using Synthetic Antiferromagnet****INVENTORS: Kyusik Sin, Ningjia Zhu, and Yingjian Chen****DESCRIPTION OF CONCEPT OR INVENTION:**

Here we disclose a method of longitudinal biasing for Bottom Spin Valve and Bottom Synthetic Spin Valve read heads. In this disclosure, the longitudinal bias is provided by synthetic antiferromagnets on top of free layer. The synthetic ferromagnet is composed of Sensing Layer(CoFe)/Ru/CoFe/Antiferromagnet. An antiferromagnetic material with higher blocking temperature, such as PtMn or PtPdMn, is used for exchange layer 1 (for the longitudinal biasing) and an antiferromagnetic material with lower blocking temperature, such as IrMn, FrMnRh, FeMn, or NiO, is used for exchange layer 2 (for pinned layer). In another scheme, an antiferromagnetic material with lower blocking temperature, such as IrMn, FeMnRh, FeMn, is used for exchange layer 1 (for the longitudinal biasing) and an antiferromagnetic material with higher blocking temperature, such as PtMn or PtPdMn, is used for exchange layer 2 (for pinned layer). The edge of the free layer is pinned by the strong pinning effect of the synthetic antiferromagnet. The track width is controlled by the longitudinal bias which is provided by the synthetic antiferromagnet.

**DESCRIPTION OF REFERENCE OR PRIOR ART IF ANY:****HOW IT IS USED?**

This method of hard biasing can be used in the spin valve reader portion of a merged read/write head employed in the magnetic storage industry for high density over 10 Gb/in<sup>2</sup>.

WHEN DID YOU BEGIN WORK?	January 2000		
WHEN WILL IT BE COMPLETE?	April 2000		
ENG. NOTEBOOK NO.	96RRC		
INVENTOR'S SIGNATURE	<i>Kyusik Sin</i>	DATE	4/18/2000
INVENTOR'S SIGNATURE	<i>Ningjia Zhu</i>	DATE	4/19/2000
WITNESSED BY	<i>Yingjian Chen</i>	DATE	4/18/2000
WITNESSED BY	<i>Guojian Chen</i>	DATE	5/05/2000